Paint & Coatings

Sector At-a-Glance

Number of Facilities:	1,500
Value of Shipments:	$20 Billion
Number of Employees:	51,000

Source: U.S. Census Bureau, 2001[1]

Profile

The paint and coatings sector[2] manufactures a variety of products that preserve, protect, and beautify the objects to which they are applied. There are four main types of paints and coatings:

- Architectural coatings used in homes and buildings, such as interior and exterior paints, primers, sealers, and varnishes;
- Industrial coatings that are factory-applied to decorate and protect manufactured goods as part of the production process;
- Special purpose coatings, such as aerosol paints, marine paints, high performance maintenance coatings, and automotive refinish paints; and
- Allied paint products, including putties, paint and varnish removers, paint thinners, pigment dispersions, and paint brush cleaners.

The paint and coatings industry has been going through a period of increasing consolidation, marked by a large number of mergers, acquisitions, and spin-offs during the last decade.

Production Process Paint and coatings are made of a variety of compounds formulated to fulfill the requirements of different applications. Paint and coatings are manufactured through the following basic steps, which must be adapted to the characteristics of different ingredients:

- Addition of raw materials (resins, dry pigments, water, or solvents, depending on the type of paint);
- Mixing/dispersion;
- Filtration; and
- Packaging the paint or coating for sale.

Partnership The National Paint and Coatings Association (NPCA) has formed a partnership with EPA's Sector Strategies Program to improve the environmental performance of the paint and coatings industry. NPCA membership includes more than 350 companies that account for close to 90% of the total dollar volume of architectural paints and industrial coatings produced in the U.S.[3]

Key Environmental Opportunities The paint and coatings sector is working with EPA to improve the industry's performance by:

- Managing and minimizing waste;
- Reducing air emissions; and
- Promoting environmental management systems.

Managing and Minimizing Waste

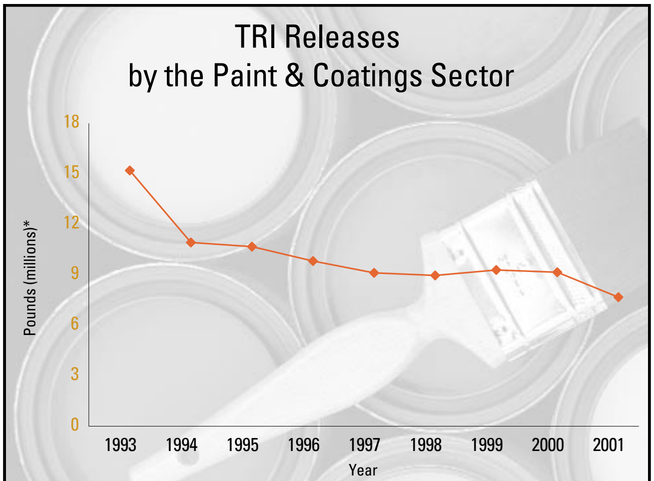
The paint and coatings sector is working to reduce generation and increase recycling of waste, as well as to address the life cycle impact of paint and coatings products.

Reduction in Environmental Releases

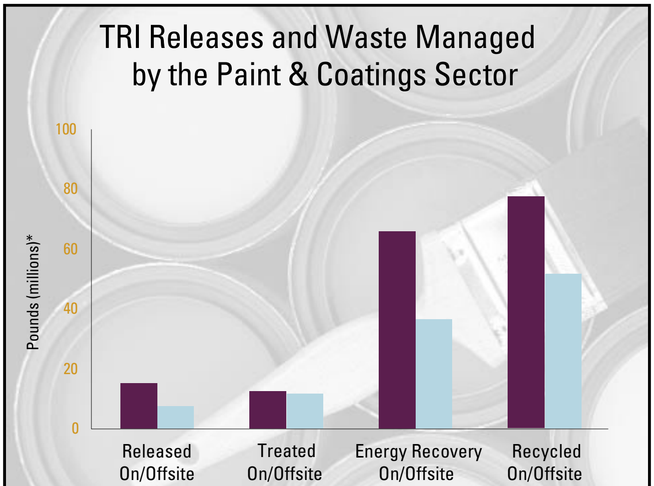
Paint and coatings facilities use a variety of chemicals and report on the release and management of many of those materials through EPA's Toxics Release Inventory (TRI). Over the past decade, the sector has made progress in reducing releases of TRI chemicals. Between 1993 and 2001, normalized TRI releases by paint and coatings facilities decreased by 50%. Most of these releases were to air. In 2001, close to 50% of the sector's TRI waste was managed through recycling.[4] While current levels of recycling across the sector are already substantial, additional opportunities may exist for further increases.

Life Cycle Impacts

The paints and coatings sector has reduced or eliminated a number of harmful constituents, such as lead and mercury, from most of its products. Opportunities still exist, however, to reduce life cycle impacts associated with the manufacture and use of paints and coatings. For example, environmental benefits could be achieved by substituting greater amounts of leftover paint for virgin raw materials in the production of new paint and coating products.



*Normalized by annual value of shipments
Sources: U.S. EPA, Toxics Release Inventory (TRI)
U.S. Census Bureau, Annual Survey of Manufactures



*Normalized by annual value of shipments
Sources: U.S. EPA, Toxics Release Inventory (TRI)
U.S. Census Bureau, Annual Survey of Manufactures

Reducing Air Emissions

Organic solvents are used as an ingredient in the production of oil-based paint and coatings because of their ability to dissolve and disperse other coating constituents. Organic solvents are also used in smaller quantities as an ingredient in the production of water-based paint and coatings, as well as in other aspects of the manufacturing process.

As organic solvents evaporate, they release emissions of volatile organic compounds (VOC) and hazardous air pollutants (HAP). These releases occur inside production facilities as well as when paint and coating products are ultimately applied to building structures, consumer products, and other surfaces.

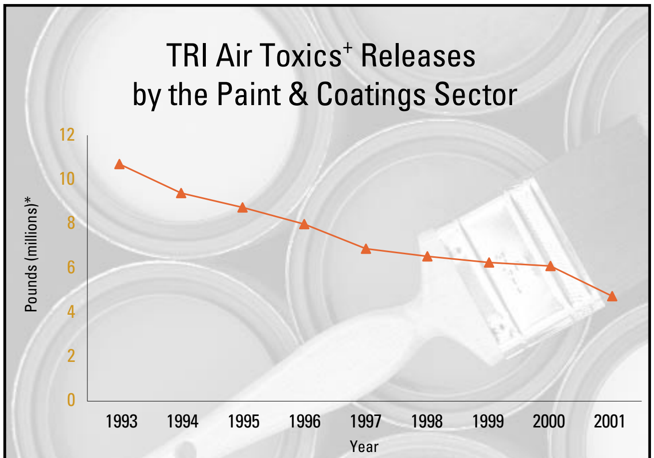
Although VOCs and HAPs resulting from the production and use of paint and coating products remain a serious environmental concern, these emissions have decreased steadily in recent years. EPA estimates that the normalized quantity of VOC emissions resulting from the manufacture of paint and coatings declined by 12% between 1996 and 2001.[5] The normalized quantity of HAP releases, as reported to TRI, declined by 56% between 1993 and 2001.[6]

Environmental regulations, changing consumer preferences, and voluntary industry efforts all contributed to these decreases. As a result of these factors:

- Environmentally preferable water-based paint has increased from approximately 35% to over 80% of architectural coating sales, over the past few decades, taking market share away from oil-based paint.[7]
- Markets for industrial and special purpose coatings have undergone transformation as customers have demanded, and manufacturers have introduced, a wide variety of more environmentally benign coating products.
- Improvements have been made in the way that paint and coating products are manufactured, handled, and applied.

The downward trend in VOC and HAP emissions is likely to continue due to:

- New regulatory requirements in recent years, including national VOC emissions standards for coatings, along with a number of Maximum Achievable Control Technology (MACT) standards for manufacturers and users of coatings products;
- New, inherently cleaner products and technologies, such as powder coatings, radiation-cured coatings, and high solids technologies; and
- Improved industrial housekeeping and application techniques, as well as advances in the manufacturing process.



+Includes the Clean Air Act hazardous air pollutants that are reported to TRI
*Normalized by annual value of shipments
Sources: U.S. EPA, Toxics Release Inventory (TRI)
U.S. Census Bureau, Annual Survey of Manufactures

Promoting Environmental Management Systems

The adoption of environmental management systems (EMS) within the paint and coatings sector is increasing rapidly. NPCA has incorporated an EMS component into its Coatings Care® program, which is a condition of membership. Consequently, in the next few years all 900 NPCA facilities should be implementing an EMS.[8]

In addition, NPCA is a Performance Track Network Partner committed to encouraging top environmental performance through EMS. Five individual paint and coatings facilities have been accepted into EPA's National Environmental Performance Track.[9]

Case Study: Coatings Care®

NPCA's Coatings Care® program is designed to provide a comprehensive system that integrates health, safety, and environmental activities within corporate planning and manufacturing operations. The EMS component of Coatings Care® fosters continuous improvement in members' environmental performance and facilitates ongoing efforts to be sensitive to community and public concerns.

In addition, the EMS component of Coatings Care® requires each participating facility to develop a quantitative inventory of emissions and discharges to all media, as well as the off-site transfer of wastes from each site. The Coatings Care® guidance suggests that facilities should identify and tabulate the volume of each permitted discharge, emission or waste on an annual basis and prepare a report presenting the findings of their inventory efforts.[10]

In 2004, the Sector Strategies Program and NPCA will jointly explore opportunities for building on Coatings Care®, as well as utilizing EPA's national environmental databases and other publicly available data, to establish a comprehensive performance measurement program for the paint and coatings sector.

Many paint and coatings companies are finding that EMS can be an effective tool for performance improvement.

Case Study: EMS at Sherwin-Williams

The Sherwin-Williams Company has implemented an EMS that not only fosters compliance with regulations as an integral part of day-to-day operations, but also charges facilities to minimize adverse safety, environmental, and health impacts through the use of integrated management systems and planning. The EMS applies to all company locations, including Sherwin-Williams' manufacturing plants, distribution service centers and warehouses, automotive branches, and commercial and retail stores.

One major component of Sherwin-Williams' EMS is waste minimization. Each of the company's plants has established recycling and/or rework programs. These programs aim to minimize the generation of cleaning materials and maximize reuse and recycling of cleaning solvents, recycling of wash water, reworking of miss-tinted paint into future batches, and recycling of cardboard, paper, and steel. As an indication of how successful the EMS has been, in 2002 Sherwin-Williams recycled more than 90 million pounds of paint, cleaning solvents, and wash water.[11]

Ports

Sector At-a-Glance

Number of Port Authorities:	82*
Value of Shipments:	$5.7 Billion**
Number of Employees:	58,000**

*Source: AAPA, 2004[1]
**Source: U.S. Census Bureau, 2001[2]

Profile The public port sector[3] consists of port authorities and agencies located along the coasts and around the Great Lakes. Typically established by enactments of state government, ports develop, manage, and promote the flow of waterborne commerce.

Ports on the coasts and inland waterways provide more than 3,000 berths for deep draft ships and transfer cargo and passengers through about 2,000 public and private marine terminals.[4] Deep water ports accommodate more than 95% by weight, and 75% by value, of all U.S. overseas trade.[5]

The port sector is facing increased pressure to develop newer, larger, and more efficient facilities to accommodate increased water trade carried by larger and larger vessels. U.S. international waterborne freight is forecast to triple by 2020.[6] In response to the increase in trade, ports spent $2.8 billion on capital improvements in 2001-2002.[7] In addition, cruise ships and other waterborne passenger services are increasingly using commercial port facilities.

Port Operations Public ports develop and maintain the shoreside facilities for the intermodal transfer of cargo between ships, barges, trucks and railroads. Ports also build and maintain cruise terminals for the cruise passenger industry. While port authorities directly operate many marine terminals, they also serve as landlords to many tenant operations. Port authority operations may also include other entities, such as airports, bridges, and railroads. Additionally, the U.S. military depends on numerous ports to serve as bases of operation and to deploy troops and equipment during national emergencies.

Partnership The American Association of Port Authorities (AAPA) has formed a partnership with EPA's Sector Strategies Program to improve the environmental performance of deep water public ports.[8] The intent is to focus on the ports where there is the greatest opportunity and capacity to make environmental improvements and then transfer tools and lessons to other ports, private shipping terminals, and related industries.

Key Environmental Opportunities The port sector is working with EPA to improve performance by:

- Reducing air emissions;
- Improving water quality;
- Minimizing impacts of growth; and
- Promoting environmental management systems.

Reducing Air Emissions

Marine vessels, land-based cargo-handling equipment, trucks, and trains all contribute to air emissions at ports. Common air pollutants from this transportation equipment include particulate matter (PM), nitrogen oxides (NO_X), and sulfur oxides (SO_X).

Port authorities typically only have direct control over a limited number of these sources, so a collaborative approach with tenants and others is the only way to get substantial reductions in emissions over the long term.

Ports are making progress in reducing air emissions by increasing the use of cleaner fuels and streamlining operations. For example:

- Most major ports have switched, or are switching, from diesel fuel to electric or hybrid power for on-dock cranes.
- The use of on-dock rail and barges, in lieu of trucks, has increased.
- Turn-around times for trucks dropping off and picking up loads at ports have decreased, resulting in a decrease in truck idling and emissions from diesel engines.

Case Study: Reducing Air Emissions at NY/NJ Port Authority

The Port Authority of New York and New Jersey and the Army Corp of Engineers are in the process of deepening critical waterways in the New York/New Jersey Harbor. Heavy machinery will be used for the deepening operations and will increase air emissions in the harbor area.

To offset these emissions, the Port Authority is exploring ways to reduce emissions associated with other port maritime activities. For example:

- *The port is retrofitting the diesel engine of one of the Staten Island Ferries with a selective catalytic reduction system in order to reduce NO_X emissions. The port is also transitioning the ferry to ultra-low sulfur fuel to reduce SO_X and PM emissions. If the test is successful, the port will make similar changes to all of its ferries, for an expected reduction of 400 to 800 tons per year of NO_X emissions.*
- *The port is replacing the diesel engine used by one of the small tugboats in the harbor with a new low-emissions diesel engine. If the initial test is successful, a larger tug will be re-powered and tested.*[9]

Improving Water Quality

Ports can improve the quality of surrounding waters by enhancing stormwater management and exploring new technologies to reduce the impact of invasive species.

Stormwater Management

Stormwater management is increasingly important in improving water quality near port facilities. Most large ports have hundreds of acres of paved waterfront property for cargo handling, where stormwater runoff may pick up various pollutants before entering waterways. Existing state stormwater regulations and new Total Maximum Daily Load (TMDL) requirements, which specify the maximum amount of pollutants that each water body can receive, are driving improvements. Voluntary efforts to improve stormwater management are also underway at some ports.

Case Study: Stormwater Management at the Port of Tampa

The Port of Tampa, FL, is in the process of redeveloping Port Ybor, a former U.S. Department of Defense facility. The port has served many industrial roles throughout its history, leaving it contaminated with petroleum products, solvents, and metals. In partnership with federal and state agencies, the Port of Tampa is cleaning up the site to make it suitable for industrial applications. The port installed an advanced stormwater system to help reduce the pollutant load into Ybor Channel, which leads to Tampa Bay. This system utilizes collection basins and baffle boxes that are capable of removing sediments and other suspended particles from stormwater so that they will not enter Ybor Channel.[10]

Invasive Species

Ships must carry ballast water for stability and ease of steering and propulsion. This ballast water often originates from ports and other coastal regions, rich in marine organisms. Ballast water is typically released in a different geographic area than where it was taken in, resulting in the introduction of non-native or invasive species to the area. Invasive species may cause both economic and environmental detriment by crowding out commercially viable species, affecting water related activities such as swimming, and impacting waterborne transportation.

To minimize the impact of invasive species, ships typically exchange ballast water in the open ocean rather than in shallow bay and harbor areas. New ballast water treatment technologies may help to further reduce the impact of invasive species. EPA's Environmental Technology Program is currently developing protocols to verify the performance of these new technologies.[11]

Minimizing Impacts of Growth

To accommodate increased water trade carried by larger vessels, many ports must increase their capacity and dredge deeper channels and harbors. While port capacity can be increased somewhat through improvements in technology and operational efficiency, many ports also require physical expansion. Surrounding communities are increasingly interested in the positive and negative impacts of port expansion, so ports must consider how best to minimize and compensate for wetland or habitat loss, properly handle sediment from dredging operations, and address other impacts of port growth.

Case Study: Natural Resource Assessment at the Port of Portland

The Port of Portland, OR, has developed a Natural Resource Assessment and Management Plan (NRAMP), the first comprehensive environmental data system of its kind, in an effort to establish a proactive policy for long-term environmental planning.

Through NRAMP, the port has created ecological maps of all port-owned properties, which can be used to identify the natural resources and wildlife habitats present in these areas. Having access to this up-to-date information will help the port to:

- *Evaluate the potential ecological effects of future projects before they begin;*
- *Avert projects with a significant negative impact to overall environmental quality; and*
- *Effectively communicate different management and development alternatives with the community.*

The system will also decrease planning costs for future development by reducing the amount of data that has to be collected for each new project and helping to avoid delays during land development.[12]

Promoting Environmental Management Systems

One way ports are proactively addressing their environmental responsibilities is through the development of environmental management systems (EMS). Although only a few ports currently have an EMS, many other ports are beginning to develop EMS in order to show leadership in environmental protection, reduce costs and improve efficiency, increase staff involvement and morale, and integrate other objectives, such as safety and security, with environmental activities.

Eleven ports are now participating in an EMS Assistance Project co-sponsored by the Sector Strategies Program and AAPA.[13] Each of the selected ports is committed to developing performance measures and sharing results with stakeholders and other interested parties. Upon completion of the project, each port will be ready to pursue certification to the ISO 14001 standard.

Case Study: EMS at the Port of Houston

The Port of Houston Authority (PHA), which manages one of the largest ports in the world, adopted an EMS at its Barbours Cut Terminal and Central Maintenance facilities in 2002. Later that year PHA became the first port in the country to receive ISO 14001 certification at any of its facilities.

Through its EMS, PHA identified six performance improvement objectives:

- *Reduce NO_X emissions;*
- *Reduce stormwater impacts;*
- *Reduce the generation of solid wastes;*
- *Increase recycling efforts;*
- *Reduce energy consumption; and*
- *Participate in the Texas Natural Resource Conservation Commission's Clean Texas Program.*

To date, PHA has reduced NO_X emissions by almost 25% through the purchase of new, cleaner engines and the use of a lower emission diesel fuel called PuriNO$_X$. PHA has also been accepted into the Clean Texas Program. By 2005, PHA expects to reduce energy consumption by 5% by making building modifications and re-powering crane engines.[14]

Case Study: EMS at the Port of Boston

In December 2003, the Port of Boston, MA, Conley Container Terminal received ISO 14001 certification, becoming the second certified U.S. public port facility. As part of its EMS, the terminal has set performance improvement objectives in eight areas: hazardous waste, wastewater, stormwater, construction waste, resource use, air emissions, spills, and noise. Initial targets include establishing baselines from which to measure progress, performing evaluations, and conducting outreach efforts. Much effort has been made to help employees understand how to minimize their environmental impact at the port.[15]

Shipbuilding & Ship Repair

Sector At-a-Glance

Number of Facilities:	680
Value of Shipments:	$12 Billion
Number of Employees:	89,000

Source: U.S. Census Bureau, 2001[1]

Profile The shipbuilding and ship repair sector[2] builds and repairs ships, barges, and other large vessels. The sector also includes operations that convert or alter ships as well as facilities that manufacture offshore oil and gas well drilling and production platforms. Most facilities that build ships also have the ability to repair ships, although some smaller yards do only repair work. Most shipyards are concentrated along the coasts, the Ohio and Mississippi Rivers, and the Great Lakes.[3]

The shipbuilding and ship repair industry has been in decline due to intense global competition and a decrease in the number of military ship orders. Throughout the 1990s, naval ship procurement averaged only six ships per year, the lowest level since 1932.[4] From 1993 to 2001, the industry's workforce decreased by 20%.[5]

Production Process New ship construction and ship repair have many industrial processes in common, including machining and metal working, metal plating and surface finishing, surface preparation, solvent cleaning, application of paints and coatings, and welding. In addition to these processes:

- New ship construction often includes parts fabrication and preassembling operations that involve cutting, shaping, bending, machining, blasting, and painting.
- Typical maintenance and repair operations include: blasting and repainting, rebuilding and installation of machinery, system replacement and overhauls, maintenance and installation, structural reconfiguration, and major remodeling of ship interiors or exteriors.

Partnerships The American Shipbuilding Association (ASA) and the Shipbuilders Council of America (SCA) have formed a partnership with EPA's Sector Strategies Program to improve the environmental performance of the shipbuilding and ship repair industry.[6]

Key Environmental Opportunities The shipbuilding and ship repair sector is working with EPA to improve the industry's performance by:

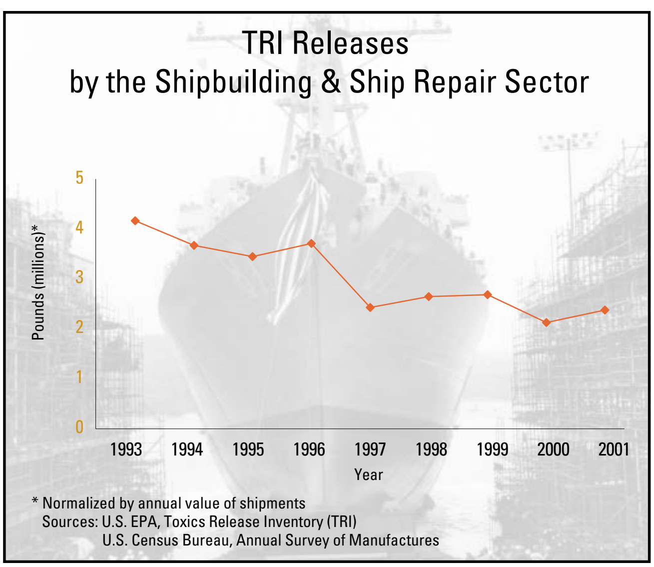
- ❒ Managing and minimizing waste;
- ❒ Reducing air emissions;
- ❒ Improving water quality; and
- ❒ Promoting environmental management systems.

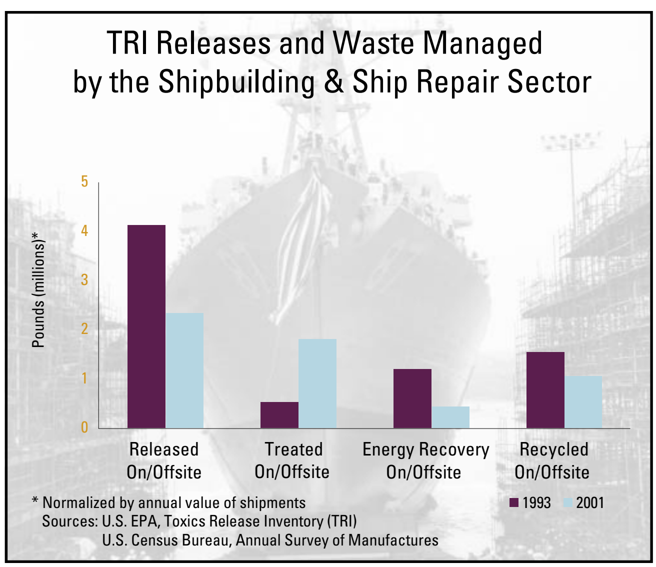
Managing and Minimizing Waste

Over the past decade, the shipbuilding and ship repair sector has made progress in reducing waste generation and increasing reuse and recycling rates. Given the diversity of their industrial processes, shipbuilding and ship repair facilities use a variety of chemicals and report on the release and management of many of those materials through EPA's Toxics Release Inventory (TRI). Between 1993 and 2001, normalized TRI releases by shipyards decreased by 43%. In 2001, treatment, energy recovery, and recycling accounted for 58% of this sector's waste management.[7]

Improvements in hazardous waste management at shipyards can be attributed to several practices, including:

- Development of improved coating application technologies, such as in-line plural component mixers that only mix the amount of coating necessary, as it is required, to avoid the waste of excess paint;
- Use of paint waste for fuel blending, rather than solidifying it for land disposal;
- Reclamation of spent solvents from spray paint equipment; and
- Recycling of spent abrasive for use as an aggregate material in the production of asphalt and cement "clinker".





Reducing Air Emissions

Because most large ships are built of steel, they must be periodically cleaned and coated in order to preserve the steel and to provide specific performance characteristics to the surface. Over the past decade, the shipbuilding and ship repair sector has reduced particulate matter (PM) emissions during surface preparation and volatile organic compound (VOC) and hazardous air pollutant (HAP) emissions during the application of paint and coatings.

Particulate Matter Emissions

Surface preparation is critical to the coating life cycle, as it provides both the physical and chemical requirements for long-term coating adhesion. To prepare surfaces for coating applications, shipyards predominantly use a dry-abrasive blasting process. This dry-abrasive blasting is typically performed outdoors, as the sheer size of a ship makes enclosure difficult and expensive.

The blasting operation generates PM emissions derived from both the break-up of the abrasive material and the removal of the existing coating. Over the past ten years, shipyards have developed ways to reduce PM emissions to the environment, including:

- Temporary containment of blasting operations;
- Material substitutions; and
- Alternative surface preparation technologies.

Early attempts at temporary containment consisted of hanging curtains from scaffolding, wires, dock-arms, and other structures around the ship. Generally, these temporary structures were open at the top and reduced PM emissions by reducing the wind speed in the blasting area. This practice has evolved to include the construction of temporary shrink-wrap enclosures of entire ships in drydock.

Case Study: Temporary Containment at Signal International

Signal International, located in MS and TX, has adapted temporary containment for use on offshore drill rigs. Their containment efforts have resulted in a 90% reduction in PM emissions from dry-abrasive blasting operations.[8]

Shipyards have also reduced PM emissions through material substitutions. Most dry abrasives used outdoors at shipyards are either sand or slags derived from coal-fired utility boilers (coal slag) or smelting (copper slag). Some abrasives result in higher PM emission rates than others. The National Shipbuilding Research Program sponsored research to determine the PM emission rates of the various types of abrasives and to analyze the life cycle costs of material substitution.[9] As a result, many shipyards are now utilizing different abrasives with lower PM emission rates.

Case Study: Material Substitution at Bath Iron Works

In 1994, Bath Iron Works (BIW) in Bath, ME, began substituting garnet abrasive for coal slag in their exterior ship dry-abrasive blasting operations. Garnet abrasive typically produces only 10% of the PM emissions of coal slag. Additionally, less abrasive is required when garnet is substituted for coal slag. BIW reports that a typical ship that once needed 300 to 500 tons of coal slag for surface preparation now requires only 200 tons of garnet.[10]

Alternative surface preparation technologies that reduce or eliminate PM emissions are also being investigated by shipyards. Of the new technologies, Ultra High Pressure Water Jetting (UHPWJ) has made the greatest inroads for surface preparation of exterior ship surfaces. Water-based surface preparation methods emit significantly less PM than dry-abrasive methods. Over the past ten years, manufacturers of UHPWJ equipment have significantly improved the performance and lowered the operating costs of the technology. Currently, 5-10% of the exterior surfaces of ships in the U.S. are prepared with UHPWJ technology.[11]

Volatile Organic Compound and Hazardous Air Pollutant Emissions

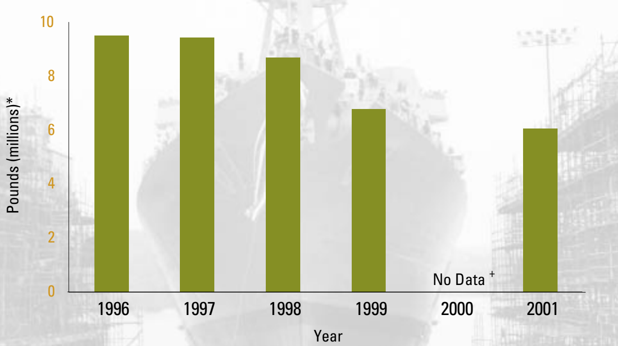
Once the ship's surface is properly prepared, coatings can be applied. The type of coating to be applied (typically down to the level of a specific brand) is specified by the customer (that is, the ship owner/operator) rather than the shipyard. These coatings may contain chemicals that are released to the environment during application.

When coatings are applied indoors, it is possible to utilize pollution control equipment, such as spray booths, to control the release of VOCs and HAPs. At shipyards, however, most coatings are applied outdoors. As a result, VOCs and HAPs may be released to the environment.

Over the last decade, shipyards have worked to reduce the VOC and HAP emissions during coating application. EPA estimates that the normalized quantity of VOC emissions from shipyards declined by 36% between 1996 and 2001.[12] The normalized quantity of HAP releases, as reported to TRI, declined by 58% between 1993 and 2001.[13]

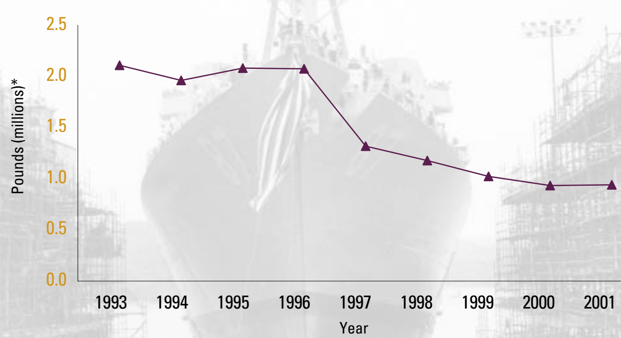
Much of the decline in both VOC and HAP emissions is due to the reformulation of marine coatings. Coatings manufacturers, working in cooperation with shipyards, have reformulated many marine coatings to reduce their VOC and HAP content, while maintaining or improving the performance characteristics required by customers. While more viscous and difficult to apply, these low-VOC, high solids content coatings have become the industry standard due to their excellent performance characteristics.

Volatile Organic Compound Emissions from the Shipbuilding & Ship Repair Sector



+Data for 2000 are not available for this sector
*Normalized by annual value of shipments
Sources: U.S. EPA, National Emission Inventory
U.S. Census Bureau, Annual Survey of Manufactures

TRI Air Toxics+ Releases by the Shipbuilding & Ship Repair Sector



+Includes the Clean Air Act hazardous air pollutants that are reported to TRI
*Normalized by annual value of shipments
Sources: U.S. EPA, Toxics Release Inventory (TRI)
U.S. Census Bureau, Annual Survey of Manufactures

Improving Water Quality

Pollutants generated by shipyards can be released into the environment via stormwater.

Case Study: Stormwater Best Management Practices

In 2002, Gulf Coast shipyards, along with representatives from EPA and state environmental agencies, formed a workgroup to improve shipyard management of stormwater. The workgroup developed a set of practical, cost-effective best management practices (BMP) aimed at reducing pollutant loadings in stormwater. In addition, the BMPs are intended to assist the shipyards in achieving other benefits, such as increased productivity, reduced materials usage and cost, reduced waste generation, reduced risk and liability, improved product quality, and increased customer satisfaction.

In 2004, participating shipyards will test BMP templates for six core shipyard processes that are believed to be major contributors to stormwater pollutant loadings:

- *Removal of hull biofoulants;*
- *Out-of-doors abrasive blasting;*
- *Abrasive materials management;*
- *Out-of-doors spray painting;*
- *Metal grinding; and*
- *Welding, burning, and cutting.*

Once the BMPs are verified, workgroup participants will encourage additional shipyards to use the BMPs to reduce stormwater pollutant loadings from their facilities.[14]

Promoting Environmental Management Systems

The adoption of environmental management systems (EMS) is increasing rapidly in the shipbuilding and ship repair industry. In December 2000, National Steel and Shipbuilding Company (NASSCO) became the first shipyard to implement an EMS and certify it to the ISO 14001 standard. During the subsequent three years there have been at least four new certifications (Bath Iron Works, Coast Guard Shipyard, Electric Boat Corporation, and Northrop Grumman Newport News), and three additional shipyards are ready to declare a functioning EMS (Bender Shipbuilding & Repair Company, FirstWave Marine, and Southwest Marine).

To encourage widespread adoption of EMS in the shipbuilding and ship repair sector, the Sector Strategies Program, ASA, and SCA have developed EMS tools for shipbuilding and ship repair facilities, including a customized EMS Implementation Guide and a brochure highlighting the financial benefits of EMS.[15] ASA and SCA are now taking the lead to continue EMS promotion through mentoring and training sessions.

Many shipyards are finding that EMS can be an effective tool for performance improvement.

Case Study: Improving Performance through EMS

Reducing waste is a common performance improvement objective for shipyards with an EMS. Through their EMS, several shipyards have reduced generation of solid and hazardous waste. For example:

- *Bath Iron Works in Bath, ME, reduced the amount of solid waste disposed by 10% between 2001 and 2002 by expanding its source recycling program and increasing employee education on the importance of recycling waste and reusing material. BIW sustained this effort in 2003 and decreased solid waste disposal by another 1%.*[16]
- *Bender Shipbuilding & Repair Company, in Mobile, AL, reduced hazardous waste generation by decreasing paint and solvent use and recycling sandblasting grit.*[17]
- *NASSCO in San Diego, CA, reduced hazardous waste and minimized VOC emissions generation by increasing its use of plural component paint systems that require less paint and solvent. In addition, NASSCO reduced the risk of unintentionally co-mingling hazardous waste with regular trash by color-coding tubs for waste segregation, conducting training, and examining tub contents prior to consolidation. NASSCO now ties waste segregation scores to housekeeping zones and publishes the scores and names of managers responsible for each zone in its weekly newsletter.*[18]

Specialty-Batch Chemicals

Sector At-a-Glance

Number of Facilities:	2,000
Value of Shipments:	$60 Billion
Number of Employees:	100,000

Source: SOCMA, 2002[1]

Profile The specialty-batch chemical sector[2] comprises companies that produce chemicals to meet the specific needs of the customer on an "as needed" basis. Specialty-batch chemicals are often not a final product, but rather a key ingredient in a final product. The following products either use or are specialty-batch chemicals: flavorings, food additives, cleaning agents, construction materials, dyes and pigments, pharmaceuticals, and cosmetics.

The states with the most specialty-batch chemical manufacturing facilities are (in descending order): California, Texas, New Jersey, New York, Illinois, North Carolina, Georgia, and Louisiana.[3] As with other sectors, over the last decade the specialty-batch chemical sector has been impacted by changes in markets and global competition.

Production Process Unlike commodity chemicals, which are manufactured for general use, specialty-batch chemicals are made to meet specific customer needs. Therefore, the raw materials, processes, operating conditions, equipment configurations, and end products change on a regular basis.

Most specialty-batch chemicals are made through "batch processing", where discrete quantities of chemicals are mixed to yield a desired compound. The process is completed on a relatively small scale and sometimes requires multiple steps. Batch producers can make hundreds of different compounds in a single year.

Partnership The Synthetic Organic Chemical Manufacturers Association (SOCMA) has formed a partnership with EPA's Sector Strategies Program to improve the environmental performance of the specialty-batch chemical industry. SOCMA's 300 member companies represent more than 2,000 manufacturing sites and more than 100,000 employees. More than 75% of SOCMA members have fewer than 500 employees.[4]

Key Environmental Opportunities The specialty-batch chemical sector is working with EPA to improve the industry's performance by:

- Enhancing performance commitments; and
- Managing and minimizing waste.

Enhancing Performance Commitments

Beginning in 2004, SOCMA members will adopt a modernized management system approach with third party certification and metrics. This Responsible Care® Management System (RCMS) will build upon the industry's existing Responsible Care® Program and its six codes of practice: community awareness and emergency response, process safety, employee health and safety, pollution prevention, distribution, and product stewardship. RCMS is based on benchmarked best practices of leading private sector companies, national regulatory requirements, and other initiatives.[5]

Performance Metrics

Public reporting of uniform, industry-wide metrics is a key part of RCMS. Such measures will enable member companies to identify areas for continuous improvement and provide a means for the public to track individual company and industry performance. RCMS measures will address performance across a broad range of issues including economics, environment, health, safety, security, and products. Specific environmental metrics will include:

- Releases to air, land, and water reported to EPA's Toxics Release Inventory (TRI);
- Greenhouse gas intensity; and
- Energy efficiency.

SOCMA members report TRI releases annually and will report on greenhouse gas and energy metrics starting in 2005.[6]

Environmental Management Systems

Another key component of RCMS is an environmental management system (EMS). At present, 73% of SOCMA's Responsible Care Coordinators report that they have a quality management system or EMS in place.[7] Fifteen of these facilities have been accepted into EPA's National Environmental Performance Track. In addition, SOCMA is a Performance Track Network Partner, committed to encouraging top environmental performance through EMS.[8] To encourage EMS adoption, SOCMA and the Sector Strategies Program developed a customized EMS Implementation Guide.[9]

Case Study: EMS at Baker Petrolite

Through their EMS, Baker Petrolite's plant in Rayne, LA:

- *Decreased annual, normalized volatile organic compound emissions by over 27% through equipment improvements and better monitoring, inspections, and preventative maintenance; and*
- *Reduced hazardous waste generation by nearly 15% over three years by reusing vat rinsate, scheduling blending to reduce the amount of rinsate needed, and closely monitoring inventory.*[10]

Managing and Minimizing Waste

Due to similarities in industrial classifications, it is difficult to isolate the environmental impact of the specialty-batch chemical sector from that of the overall chemical industry. Between 1993 and 2001, normalized TRI releases by the entire chemical sector decreased by 65%. During this same time period, most of the sector's waste was recycled or treated rather than released. For example, in 2001, 41% of the chemical sector's TRI releases and waste managed was recycled, and 37% was treated.[11]